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Organizadores

Roberto Giolo de Almeida (Coordenador)

Patrícia Perondi Anchão Oliveira

Maurício Saito

Cleber Oliveira Soares

Lucas Galvan

Lucimara Chiari

Fabiana Villa Alves

Davi José Bungenstab

Embrapa

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Fone: (67) 3368 2000

Fax: (67) 3368 2150

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WEB PLATFORM FOR GEOSPATIAL INFORMATION: APPLICATIONS FOR GEOPECUS PROJECT

Giovana M. BETTIOL¹; Lidia MOURA²; Sandra F. NOGUEIRA³; Debora P. DRUCKER⁴; Patrícia P.

A. OLIVEIRA¹; Carlos Fernando QUARTAROLI³; Cristina A. G. RODRIGUES³; Gustavo BAYMA-SILVA³

¹ Embrapa Pecuária Sudeste, ² Federal University of São Carlos (UFSCAR), ³ Embrapa Monitoramento por Satélite, ⁴ Embrapa Informática Agropecuária

E-mail address of presenting author*: giovana.bettiol@embrapa.br

Introduction

According to the IPCC (2014), livestock is responsible for a large portion of CH₄ emissions, originated mostly from enteric fermentation. However, establishing the dynamics of greenhouse gases (GHG) is very complex, especially for integrated production systems such as silvopastoral, which are seen as alternatives to reduce GHG emissions (BERNDT, 2010). In this context, the PECUS Research Network - Greenhouse Gases Dynamics in Brazilian Livestock Production Systems - was created by Embrapa (Brazilian Agricultural Research Corporation) in order to evaluate GHG dynamics in agricultural systems in six Brazilian biomes (Atlantic Forest, Caatinga, Pantanal, Pampa, Amazon and Cerrado), involving more than 300 Brazilian and international researchers. The GeoPECUS - Geotechnologies Applied to Dynamics of Greenhouse Gases in Brazilian Agriculture - project has the responsibility to support PECUS with geotechnologies based on remote sensing, generating information which may subsidize the government in the creation of environmental and economically sustainable policies for agriculture.

Geospatial data generation and storage capacity are growing as consequence of increased computational resources available to users from various sectors, including remote sensing (BAYMA-SILVA et al.,

2015). Researches in the environmental area apply geoprocessing and WebGIS (GIS system that uses web technologies) as powerful tools for spatial analysis and environmental management. According to Barriguinha (2008), the internet can be considered a privileged environment to make available large amounts of geographic information, expanding its access. A process for geospatial data organization is needed in order to make this type of information accessible and understandable to potential users.

The National Commission of Cartography (CONCAR), through the work of its specialized committees, have set standards and rules to be adopted in the production and publishing of geospatial data and information by public institutions. Considering this, the Brazilian National Spatial Data Infrastructure (INDE) was instituted with the purpose of cataloging, integrating and harmonizing existing geospatial data in Brazilian government institutions. Thus, this data can be easily located, explored and accessed for various uses, by any client with access to the Internet. Geospatial data should be cataloged using their respective metadata, published by the producers/maintainers of such data. The coordination of this infrastructure is responsibility of CONCAR.

The aim of this article is to describe and report how the GeoPECUS project is using the standards and rules established by the Brazilian National SDI to publish and organize the geospatial data produced by the PECUS Research Network.

Material and Methods

For the present project, it was used Embrapa Spatial Data Infrastructure, GeoInfo (Drucker et al. 2015) - Figure 1. One of its tools is Geonode (<http://www.geonode.org>), which is a web-based application and platform for developing Geospatial Information Systems (GIS) and for deploying spatial data infrastructures (SDI). It is designed to be extended, modified and can be integrated into existing platforms. Considering this, Geonode was adapted in order to

present all the fields recommended by CONCAR, especially in metadata information. CONCAR metadata specifications are based on widely adopted OGC standards, specially ISO-19115.



Figure 1. Main interface of GeolInfo: Embrapa Spatial Data Infrastructure

A pattern in the attribute tables of the geospatial data was planned to allow that all experimental areas of the GeoPECUS project, which are the same of PECUS Research Network, have the same variables, so that it would be possible to make comparisons and other analysis. The geospatial data comprises detailed information about the production systems and vector archives of the experimental areas. It also comprises the orbital images of the experimental areas, from different satellites (Geoeye, Ikonos and WorldView), ortorectified and added into GeolInfo as layers.

Maps were elaborated in AO format and uploaded as image files and attribute tables of the experimental areas were transferred to platform as documents. All metadata information was cataloged and is available in the platform as shown in Figure 2. Furthermore, it shows all tabs available in GeolInfo related to geospatial information.



Figure 2. Visualization of one layer example of geospatial information available in GeoInfo, highlighting the metadata link.

All data previously reported was uploaded in this platform in its respective tabs, for example, "Layers" for the boundaries shapefiles and ortorectified images, "Documents" for the shapefiles' table of attributes and A0 maps. In the tab "Maps", maps were elaborated for the

respective experimental areas, highlighting the production systems and ortorectified images that were added as base to these layers. It is important to highlight that the permission to download, visualize, edit a layer or metadata information is given by the platform user, according to the rules established by GeoInfo.

Results and Conclusions

Until now, it was uploaded information of twenty-three experimental areas of GeoPECUS project: files in vector format, table of attributes related to the experimental areas organized in spreadsheet format and also twenty-three maps related to these areas. Among these areas, six correspond to the Amazon Rainforest biome, six to the Cerrado biome, five to the Atlantic Forest biome, three to the Pampa biome, two to the Caatinga biome and one to the Pantanal biome. Thirty-five A0

maps were uploaded as image files, but not all areas were covered by AO maps and some of them were covered by more than one. The GeoInfo platform contains not only GeoPECUS data but also geospatial data from other projects (e.g. Climatic Risk Zoning), which indicates that this web platform is an efficient tool to organize geoinformation and disseminate this type of data to researches, who may seek references. Furthermore, it is a way to give publicity to the results achieved in the PECUS Research Network for the general population.

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